DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-5, 11, 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 57-23770.

To the extent that JP'770 does not expressly disclose the cylindrical structure of applicant's claims it is obvious to one having ordinary skill in the art that the feature 01a is cylindrical as engines conventionally employ cylinders as the conventional combustion chamber shape.

Applicant's claims are below with relevant citations.

Claim 1 (Original): A combustion apparatus comprising:
a cylindrical combustion chamber **(feature 01a)**;

an air supply portion for supplying combustion air into said combustion chamber**(feature 03)**; and

a fuel supply portion for supplying fuel into said combustion chamber **(feature 2)**,
wherein a flow of the combustion air supplied into said combustion chamber first crosses a track of the fuel supplied into said combustion chamber at a region away from said fuel supply portion and then crosses the track of the supplied fuel again at a region near said
fuel supply portion **(figure 3)**.

Regarding claim 2 see figure 3 features A and a, further the air flow has a positive x velocity component opposing the central axis fuel flow component and a circumferential velocity component responsible for swirl.

Regarding claim 3 see fuel flow feature a and air flow path from feature 3.

Claim 4 (Original): A combustion apparatus comprising:

a cylindrical container having a close end and an open end **(figure 3; feature 5 and opposite closed end)**;

an infow passage for supplying combustion air into a combustion chamber in said cylindrical container said inflow passage being formed at a location away from said close end in a direction of a central axis of said cylindrical container so as to extend through a side surface of said cylindrical container**(feature 3)**; and

a fuel nozzle provided inside of said close end of said cylindrical container for supplying fuel into said combustion chamber in said cylindrical container**(feature 2)**,

wherein said inflow passage is configured so as to form a flow of the air with a velocity component in the direction of the central axis of said cylindrical container from said open end to said close end and a velocity component to swirl in a circumferential direction of said cylindrical container

(air flow has both x and y velocity components, x component is in direction of claimed axis),

wherein said fuel nozzle is configured so as to inject the fuel toward said inflow passage with a velocity component in the direction of the central axis of said cylindrical container from said close end to said open end and a velocity component directed radially outward **(feature A and a)**.

Claim 5 (Original): A combustion apparatus comprising:
a cylindrical container having a close end and an open end **(fig. 3)**;

an inflow passage for supplying combustion air into a combustion chamber in said cylindrical container **(feature 3)**; and

a fuel nozzle for supplying fuel into said combustion chamber in said cylindrical container **(feature 2)**,

wherein said cylindrical container has a portion having a reduced diameter at a location away from said close end along a central axis of said cylindrical container by a predetermined distance **(feature 5)**,

wherein said inflow passage is formed at said potion having a reduced diameter in said cylindrical container and is configured so as to form a flow of the air with a velocity component in the direction of the central axis of said cylindrical container from said open end to said close end and a velocity component to swirl in a circumferential direction of said cylindrical container **(feature 3 and air flow emanating from feature 3)**,

wherein said fuel nozzle is configured so as to inject the fuel toward said inflow passage with a velocity component in the direction of the central axis of said cylindrical container from said close end to said open end and a velocity component directed radially outward **(feature 2, A and a)**.

Claim 11 (Original): A combustion method of supplying combustion air and fuel in a combustion chamber in a combustion apparatus, and mixing and combusting the combustion air and the fuel **(figure 3)**,

wherein a track of an air flow and a track of a fuel flow are not the same in said combustion chamber **(flows from feature 2 and 3)**,

wherein the track of the air flow first crosses the track of the fuel flow at a region near a tip of the track of the fuel flow and then crosses the track of the fuel flow again at a region from a root of the track of the fuel flow to a vicinity of the tip **(flow from feature 3)**.

Regarding claim 12 see figure 3 features 2, A and a, and the flow emanating from feature 3.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP '770 as applied to claim 4 above, and further in view of JP 48 21227.

To the extent that JP '770 does not expressly disclose the second inflow passage of applicant's claims JP '227 figure 2 feature 6 teaches this as conventionally known and practiced for fuel combustion.

Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP '770 as applied to claim 4

above, and further in view of Johnson U.S. 6,481,209 figure 3.

To the extent that JP '770 does not expressly disclose the flow adjusting structure of applicant's claims 8 and 9 Johnson figure 3 teaches this as conventionally known and practiced for improved combustion.

To the extent that JP '770 does not expressly disclose the additional fuel nozzle structure of applicant's claim 10 Johnson figure 3 feature 140 teaches this as conventionally known and practiced for improved combustion.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 57-23770 in view of Von Linde U.S. 3,869,244.

To the extent that JP'770 does not expressly detail the connecting member of applicant's claims Von Linde

figure 1 feature 22 teaches this as conventionally known and practiced for the combustion of a fuel.

Applicant's claim is below with relevant citations.

Claim 6 (Original): A combustion apparatus comprising:
a cylindrical container having a close end and an open end **(JP'770 fig. 3)**;

a cylindrical member disposed substantially coaxially with a central axis of said cylindrical container and positioned on said open end side, said cylindrical member having a diameter smaller than that of said cylindrical container **(JP'770 feature 5)**;

an annular connecting member connecting said open end of said cylindrical container and an outer circumferential surface of said cylindrical member to each other **(Von Linde feature 22)**;

an inflow passage formed in said connecting member for supplying combustion air into said combustion chamber in said cylindrical container **(Von Linde feature 22 and air flow thru)**; and

a fuel nozzle provided inside of said close end of said cylindrical container for supplying fuel into said combustion chamber in said cylindrical container **(JP'770 feature 2)**,

wherein said inflow passage is configured so as to form a flow of the air with a velocity component in the direction of the central axis of said cylindrical container from said open end to said close end and a velocity component to swirl in a circumferential direction of said cylindrical container **(JP'770 feature 3 and air flow emanating from feature 3)**,

wherein said fuel nozzle is configured so as to inject the fuel toward said inflow passage with a velocity component in the direction of the central axis of said cylindrical container from said close end to said open end and a velocity component directed radially outward **(feature 2, A and a)**.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to J.PAGE HUFTY whose telephone number is (571)272-9966. The examiner can normally be reached on 9:00 am - 5:00pm, Mon- Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen K. Cronin can be reached on 571-272-4536. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. Page Hufty/
Examiner, Art Unit 3747

/Thomas N Moulis/
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